C L A I M S

1. A semiconductor optical device characterized by comprising:

a semiconductor substrate; and

an active layer which is formed above the semiconductor substrate, the active layer having a plurality of quantum wells formed from a plurality of barrier layers and a plurality of well layers sandwiched among the plurality of barrier layers, wherein,

at least one well layer of the plurality of well layers is formed from an $In_{xa}Ga_{(1-xa)}As$ film, and a composition ratio xa of the In takes any one value within a range from approximately 0.05 to approximately 0.20, whereby the at least one well layer is formed as a strained well layer in which lattice distortion bought about in the well layer takes any one value within a range from approximately 0.35% to approximately 1.5%, and

due to the strained well layer being formed so as to have a bandgap wavelength different from those of the other well layers,

the semiconductor optical device is configured capable of representing, as an optical spectral characteristic, a broad optical spectral characteristic whose center wavelength is from approximately 800 nm to approximately 850 nm, and which has a spectral half

bandwidth greater than or equal to a predetermined value.

2. The semiconductor optical device according to claim 1, characterized in that the strained well layer has any one layer thickness within a range from approximately 2.5 nm to approximately 5 nm.

3. The semiconductor optical device according to claim 1, characterized in that the plurality of quantum wells included in the active layer respectively have substantially identical layer thickness.

4. The semiconductor optical device according to claim 1, characterized in that the semiconductor optical device is applied as a super luminescent diode (SLD).

5. The semiconductor optical device according to claim 1, characterized in that the semiconductor optical device is applied as a semiconductor optical amplifier.

6. The semiconductor optical device according to claim 1, characterized in that the semiconductor optical device is applied as an amplifying element for an external resonator type semiconductor laser.

7. The semiconductor optical device according to claim 1, characterized in that an n-GaAs substrate is used as the semiconductor substrate.

8. The semiconductor optical device according to claim 4, characterized in that

the SLD comprises, as the semiconductor optical device: a first cladding layer formed above a surface of the semiconductor substrate; the active layer formed above the first cladding layer; a second cladding layer formed above the active layer; an etching blocking layer formed in the second cladding layer; a contact layer formed above the second cladding layer; an insulating film formed above the contact layer and above the etching blocking layer; a first electrode formed above the insulating film; and a second electrode formed on a rear face of the semiconductor substrate, and

has:

a ridge portion which serves as a gain region, the ridge portion being formed in a trapezoidal shape above the etching blocking layer at a central portion of the semiconductor optical device in a shorter direction, and in a stripe form above the etching blocking layer at a position from one facet to a vicinity of a central portion of the semiconductor optical device in a longitudinal direction of the semiconductor optical device;

an absorption region which absorbs light and electric current, the absorption region being formed in a stripe form in an inside of the semiconductor optical device including the active layer at a position adjacent to the ridge portion from a vicinity of the

central portion to another facet of the semiconductor optical device in the longitudinal direction of the semiconductor optical device;

regions to which light is not guided, the regions being formed at positions facing both side portions of the ridge portion; and

an antireflection coating which is formed at one facet in the longitudinal direction of the semiconductor optical device.

9. The semiconductor optical device according to claim 5, characterized in that

the semiconductor optical amplifier comprises, as the semiconductor optical device: a first cladding layer formed above a surface of the semiconductor substrate; the active layer formed above the first cladding layer; a second cladding layer formed above the active layer; an etching blocking layer formed in the second cladding layer; a contact layer formed above the second cladding layer; an insulating film formed above the contact layer; a first electrode formed above the insulating film; and a second electrode formed on a rear face of the semiconductor substrate, and

has: a gain region formed above the etching blocking layer; first and second antireflection coatings into and from which light is incident and emitted, the first and second antireflection coatings being formed on both facets of the semiconductor

optical device; and first and second current non-injection regions formed in vicinities of both facets of the gain region.

10. A method of manufacturing a semiconductor optical device, characterized by comprising:

a step of sequentially depositing a first cladding layer made of an n-$Al_{xb}Ga_{(1-xb)}As$ layer, an active layer including a plurality of well layers made of undoped $In_{xa}Ga_{(1-xa)}As$ and a plurality of barrier layers made of undoped $Al_{xc}Ga_{(1-xc)}As$, a second cladding layer made of a p-$Al_{xb}Ga_{(1-xb)}As$ layer, an etching blocking layer in the second cladding layer, and a contact layer made of p^+-GaAs above a (100) plane of a semiconductor substrate made of n-GaAs;

a step of forming a ridge isolation resist pattern to isolate a ridge portion and a non-waveguide portion on the contact layer;

a step of forming isolation grooves which isolate the ridge portion and the non-waveguide portion by removing portions of the second cladding layer and the contact layer at a side further toward a surface than the etching blocking layer with the ridge isolation resist pattern being as an etching mask;

a step of forming an insulating film after the isolation grooves are formed;

a step of forming a contact hole forming resist pattern to form a contact hole by removing a portion of

the insulating film above the ridge portion;

a step of removing a portion of the insulating film above the ridge portion after a contact hole is formed with the contact hole forming resist pattern being as an etching mask;

a step of forming a p-electrode from the surface side of the semiconductor substrate after the contact hole is formed;

a step of making the semiconductor substrate be a predetermined thickness by grinding a rear face of the semiconductor substrate after the p-electrode is formed; and

a step of forming an n-electrode on the rear face of the semiconductor substrate after the semiconductor substrate is grinded so as to be a predetermined thickness, wherein

at least one well layer of the plurality of well layers is formed from an $In_{xa}Ga_{(1-xa)}As$ film, and a composition ratio xa of the In takes any one value within a range from approximately 0.05 to approximately 0.20, whereby the semiconductor optical device is formed as a strained well layer in which lattice distortion takes any one value within a range from approximately 0.35% to approximately 1.5%, and

due to the strained well layer being formed so as to have a bandgap wavelength different from those of the other well layers,

the semiconductor optical device is configured capable of representing, as an optical spectral characteristic, a broad optical spectral characteristic whose center wavelength is from approximately 800 nm to approximately 850 nm, and which has a spectral half bandwidth greater than or equal to a predetermined value.

11. An external resonator type semiconductor laser characterized by comprising:

a semiconductor optical device which emits light within a predetermined wavelength range; and

an external resonator which receives the light within a predetermined wavelength range emitted from the semiconductor optical device, and which selects a light of a predetermined wavelength to be returned to the semiconductor optical device, wherein

the semiconductor optical device comprises:

a semiconductor substrate; and

an active layer which is formed above the semiconductor substrate, the active layer having a plurality of quantum wells formed from a plurality of barrier layers and a plurality of well layers sandwiched among the plurality of barrier layers,

at least one well layer of the plurality of well layers is formed from an $In_{xa}Ga_{(1-xa)}As$ film, and a composition ratio xa of the In takes any one value within a range from approximately 0.05 to approximately

0.20, whereby the at least one well layer is formed as a strained well layer in which lattice distortion bought about in the well layer takes any one value within a range from approximately 0.35% to approximately 1.5%, and

due to the strained well layer being formed so as to have a bandgap wavelength different from those of the other well layers,

the semiconductor optical device is configured capable of representing, as an optical spectral characteristic, a broad optical spectral characteristic whose center wavelength is from approximately 800 nm to approximately 850 nm, and which has a spectral half bandwidth greater than or equal to a predetermined value, and

the external resonator comprises:

wavelength selection means for receiving the light within a predetermined wavelength range emitted from the semiconductor optical device, and selecting a light of a predetermined wavelength; and

optical means, which is provided between the semiconductor optical device and the wavelength selection means, for causing the light within a predetermined wavelength range emitted from the semiconductor optical device to be incident into the wavelength selection means, and returning the light of a predetermined wavelength selected by the wavelength

selection means to the semiconductor optical device.

12. The external resonator type semiconductor laser according to claim 11, characterized in that the wavelength selection means of the external resonator is configured by a diffraction grating at which a wavelength of a reflected light is selectable by changing an angle of reflection.

13. The external resonator type semiconductor laser according to claim 11, characterized in that the wavelength selection means of the external resonator is configured by a wavelength tunable filter and a total reflection mirror.

14. The external resonator type semiconductor laser according to claim 11, characterized in that the strained well layer of the semiconductor optical device has any one layer thickness within a range from approximately 2.5 nm to approximately 5 nm.

15. The external resonator type semiconductor laser according to claim 11, characterized in that the plurality of quantum wells included in the active layer of the semiconductor optical device respectively have substantially identical layer thickness.

16. The external resonator type semiconductor laser according to claim 11, characterized in that an n-GaAs substrate is used as the semiconductor substrate of the semiconductor optical device.

17. The external resonator type semiconductor

laser according to claim 11, characterized in that

the semiconductor optical device comprises:

a first cladding layer formed above a surface of the semiconductor substrate, the active layer formed above the first cladding layer, a second cladding layer formed above the active layer, an etching blocking layer formed in the second cladding layer, a contact layer formed above the second cladding layer, an insulating film formed above the contact layer, a first electrode formed above the insulating film on the contact layer, and a second electrode formed on a rear face of the semiconductor substrate, and

the semiconductor optical device has: a gain region formed above the etching blocking layer; first and second antireflection coatings into and from which light is incident and emitted, the first and second antireflection coatings being formed on both facets; and first and second current non-injection regions formed in vicinities of both facets of the gain region.